

CLAIMS

I claim:

1. A method, comprising:

forming a first via dielectric layer on a substrate;

patterning the first via dielectric layer to form a via through the first via dielectric layer;

forming a photosensitive trench dielectric layer on the first via dielectric layer;

patterning the photosensitive trench dielectric layer to form a trench through the photosensitive trench dielectric layer;

depositing a conductive material in the via and the trench;

forming a top layer on the photosensitive trench dielectric layer; and

decomposing, at least partially, the photosensitive trench dielectric layer,
decomposed material from the photosensitive trench dielectric layer
passing through the top layer.
2. The method of claim 1, wherein decomposing the photosensitive trench dielectric layer comprises heating the photosensitive trench dielectric layer to a temperature in a range from about 180 degrees Celsius to about 400 degrees Celsius.
3. The method of claim 1, wherein patterning the photosensitive trench dielectric layer comprises directly patterning the photosensitive trench dielectric layer.
4. The method of claim 3, wherein patterning the photosensitive trench dielectric layer comprises patterning the photosensitive trench dielectric layer without using a separate photoresist layer on the photosensitive trench dielectric layer.

5. The method of claim 1, wherein the photosensitive trench dielectric layer is substantially completely decomposed, leaving an air gap between the first and second via dielectric layers.

6. The method of claim 1, wherein the photosensitive trench dielectric layer is partially decomposed, leaving a partial air gap between the first and second via dielectric layers.

7. The method of claim 1, wherein the photosensitive trench dielectric layer comprises a matrix material and porogen material, and decomposing the photosensitive trench dielectric layer comprises removing at least some of the porogen material from the matrix material, leaving a porous trench dielectric layer between the first and second via dielectric layers.

8. The method of claim 1, wherein the photosensitive trench dielectric layer comprises at least one of a photoresist material, a photosensitive polynorbornene material, a photosensitive polysilazane material, a photosensitive benzocyclobutene, a photosensitive polyarylene, a photosensitive polysiloxane, a photosensitive polybenzoxazole, a photosensitive polyborazylene, or a photosensitive fused ring polymer.

9. The method of claim 1, further comprising:

forming a coating layer on the patterned trench dielectric layer;

forming a conductor seed layer on the coating layer; and

forming a cap layer on the deposited conductive material in the via and the trench.

10. A device, comprising:

a substrate;

a first via dielectric layer on the substrate;

a trench dielectric layer on the first via dielectric layer, wherein the trench layer comprises a photosensitive trench material layer that has been at least partially decomposed;

a trench through the trench dielectric layer;

a conductor extending through the first via dielectric layer and substantially filling the trench in the photosensitive trench dielectric layer; and

a top layer on the photosensitive trench dielectric layer.

11. The device of claim 10, wherein the trench dielectric layer comprises a porous dielectric layer, wherein in the at least partial decomposition of the photosensitive trench material layer a porogen has been removed from pores in the trench dielectric layer.

12. The device of claim 10, wherein the trench through the trench dielectric layer was formed by directly patterning the photosensitive trench dielectric layer.

13. The device of claim 10, wherein the top layer comprises a second via dielectric layer directly in contact with the trench dielectric layer.

14. The device of claim 10, wherein the second dielectric layer comprises at least one of a photoresist material, a photosensitive polynorbornene material, a photosensitive polysilazane material, a photosensitive benzocyclobutene, a photosensitive polyarylene, a photosensitive polysiloxane, a photosensitive polybenzoxazole, a photosensitive polyborazylene, or a photosensitive fused ring polymer.

15. A device, comprising:

a substrate;

a first via dielectric layer on the substrate;

a photosensitive trench material layer on the first via dielectric layer;

a trench through the photosensitive trench material layer;

a conductor extending through the first via dielectric layer and substantially filling the trench in the photosensitive trench material layer; and

a top layer on the photosensitive trench material layer.

16. The device of claim 15, wherein the photosensitive trench material layer comprises a porous matrix material and a porogen material within pores of the porous matrix material.

17. The device of claim 15, wherein the trench through the trench dielectric layer was formed by directly patterning the photosensitive trench dielectric layer.

18. The device of claim 15, wherein the top layer comprises a second via dielectric layer directly in contact with the photosensitive trench material layer.

19. The device of claim 15, wherein the photosensitive trench material layer comprises at least one of a photoresist material, a photosensitive polynorbornene material, a photosensitive polysilazane material, a photosensitive benzocyclobutene, a photosensitive polyarylene, a photosensitive polysiloxane, a photosensitive polybenzoxazole, a photosensitive polyborazylene, or a photosensitive fused ring polymer.

20. A method, comprising:

forming a photosensitive trench dielectric layer on a substrate; and

directly patterning the photosensitive trench dielectric layer to form a trench through the photosensitive trench dielectric layer.

21. The method of claim 20, further comprising:

depositing a conductive material in the trench;

forming a top layer on the photosensitive trench dielectric layer; and

decomposing, at least partially, the photosensitive trench dielectric layer, decomposed material from the photosensitive trench dielectric layer passing through the top layer.

22. The method of claim 21, wherein patterning the photosensitive trench dielectric layer comprises patterning the photosensitive trench dielectric layer without using an anti-reflective layer.

23. The method of claim 20, wherein the photosensitive trench dielectric layer comprises at least one of a photoresist material, a photosensitive polynorbornene material, a photosensitive polysilazane material, a photosensitive benzocyclobutene, a photosensitive polyarylene, a photosensitive polysiloxane, a photosensitive polybenzoxazole, a photosensitive polyborazylene, or a photosensitive fused ring polymer.